Activity 4

# Dealing with Chemical Emergencies

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| **Duration** | 1 class period |
| **Grade Level** | 7-12 |
| **Key Terms/ Concepts** | Acute<br>Chronic<br>Emergency<br>Exposure<br>Hazardous material<br>Release<br>Residual Contamination<br>Superfund |
| **Suggested Subjects** | Chemistry<br>Physical Science |

## Purpose

This activity helps students understand how Federal, state, and local authorities respond to chemical emergencies. In a facilitated discussion, students identify activities that can result in spills and other emergency situations that may cause hazardous materials to be released. The difference between emergency situations and other times when hazardous substances may be released into the environment is explained. Students also discuss how Federal, state, and local authorities respond to spills and other releases of contaminants into the environment.

## Background

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) directs the U.S. Environmental Protection Agency (EPA) and other Federal agencies to respond to **emergency** situations where **exposure** to **hazardous materials** poses an immediate risk of harm. Emergency situations covered by Superfund include chemical spills or fires. These situations require immediate action to reduce or remove toxic hazards and stabilize the contaminated area to prevent or minimize damage to people and the environment. Usually state and local authorities are the first at the scene of an emergency. After the immediate emergency has been addressed, the site is evaluated to determine whether additional work is necessary. If so, EPA, the state, or the responsible party will clean up the contamination.

For more information on emergency planning and response, see the Suggested Reading list found at the end of the Haz-Ed materials. Other Haz-Ed materials that are related to this topic include *Warm-Up 1: Defining Hazardous Waste* and *Warm-Up 2: EPA's Superfund Program—Overview*.

## Preparation

1. Gather the following materials:

    - Copies for each student of:
      *Fact Flash 1*: *Hazardous Substances and Hazardous Waste*
      *Fact Flash 2: The Superfund Cleanup Program*

    - Copies for each student of the following Student Handout, *Hazardous Materials Emergencies.*

2. Read Fact Flashes 1 and 2 to prepare your lecture.

3. Distribute Fact Flashes 1 and 2 and assign students to read them for homework.

## Procedure

1. Review the characteristics of hazardous substances and the strategy for emergency responses under the Superfund Program, using the information in the Fact Flashes students read for homework. Point out that this discussion will focus on situations involving brief exposures to uncontrolled hazardous materials as happens in emergencies.

2. Ask students to recall any emergencies that have occured in their community or state involving chemical spills, explosions, fires, or other incidents involving a **release** of hazardous materials . Examples include a highway accident involving an overturned truck carrying hazardous materials, derailment of railroad tank cars carrying hazardous materials, an explosion at an industrial plant, or an evacuation of a neighborhood because of a hazardous materials spill or leak.

3. Have a student list the incidents mentioned on the chalkboard. Have students discuss the circumstances surrounding these events. What happened? What chemicals were released? Were the chemicals explosive, toxic, ignitable, or chemically reactive? How was the emergency resolved?

4. Distribute copies of the Student Handout, *Hazardous Materials Emergencies*. Give them 5 or 10 minutes to read it.

    Use the incidents in the Student Handout as a basis for discussion.

5. Ask students what activities and situations could result in accidents involving the acute release of hazardous materials. Make a list of these activities on the chalkboard, noting the names of any actual occurrences the class can name. Ask what these types of activities have in common, besides the handling of hazardous materials. *(This discussion should point out that many such incidents occur at industrial plants or when hazardous materials are transported and that many pose a threat to people in the vicinity.)*

6. Go back to the list of incidents on the chalkboard. Ask students to suggest what kinds of things would have to be done to respond effectively in each case. (For example, a chemical spill that contaminates drinking water could require an alternative supply of drinking water, or a chemical fire could require evacuating a neighborhood or a whole community.)

7. Ask students who they would expect to respond to these incidents. Would the response be handled locally or would it require outside help? Who would decide on the "action plan" for responding? How would they know what types of hazardous materials are involved? If you were responsible for making such decisions, what other sorts of information would you want?

8. Ask students what makes an emergency different from any other incident. Is it the materials involved, the threat posed to the general population, or something else? Does an emergency require some sort of sudden event (for example, an explosion, fire, train wreck)? What sort of "emergency" might not involve a sudden event (for example, a slow gasoline leak into a river)?

9. Explain to students that whether an incident is considered an emergency under the Federal Superfund Program depends on the type of threat posed. For example**,** explosions or fires in a chemical plant require an immediate response which, in turn, requires quick decisions and immediate action to reduce or eliminate hazards and stabilize the environment. Other threats, such as a gasoline leak, once under control, allow for a longer planning and decision making process related to the cleanup.

   *NOTE: You may want to point out to students that the quick decisions needed to deal with an "emergency" can sometimes result in more long-term problems. For example, hundreds of miles of Germany's Rhine River were polluted following a chemical fire at Basel, Switzerland. Firefighters used water to extinguish the blaze. The runoff from the firefighting washed tons of chemicals into the river.*

10. Ask students how they would decide that the "emergency" is over? What if there is leftover contamination? Who would they expect to deal with it?

## Extensions (Optional)

- Invite local firefighters or emergency medical technicians to speak to the class on how their departments respond to chemical emergencies and how they interact with other authorities in these situations. Encourage the speakers to bring along any special equipment used in those situations.

- Ask for three volunteers. Assign one to visit the local police department, another the local fire department, and the third the local emergency medical service (EMS), which may be part of the fire department in some communities. Have the students interview officials about their chemical emergency preparedness. Have them explore how emergency calls are received and what plans are set into motion. What would happen locally in the event of a hazardous material emergency? What actual emergencies has the department handled? What is their interaction with state and Federal authorities in these situations? Have the students prepare and present the results of their interviews to the class.

- Invite an EPA or state On-Scene Coordinator (OSC) involved in overseeing hazardous waste cleanup projects to discuss a real emergency cleanup in your state or region. Use the Contacts and Resources listed at the end of the Haz-Ed materials.

# Hazardous Materials Emergencies

**Charlotte, New York, April 1995.** A fire started at a tire dump in Charlotte, Chatauqua County, New York, about 40 miles southwest of Buffalo. The dump covers about 15 acres and holds from 2 to 3 million tires, which are stacked 12-30 feet deep throughout the dump. The cause of the fire was unknown. About 33 local fire companies responded and began efforts to isolate and control the fire, which engulfed 4 to 5 acres. Response personnel set up a containment area for runoff. EPA's On-Scene Coordinator responded to the scene to provide air monitoring and technical support to local response personnel.

**Lodi, New Jersey, April 1995.** An explosion and fire at a plant that manufactures pharmaceutical chemicals killed at least 2 people, injured 12 others, and caused the evacuation of about 900 residents and schoolchildren in the area. EPA's On-Scene Coordinator and the Agency's Environmental Response Team responded to help local and state officials with air and water monitoring at the site. In addition, the U.S. Coast Guard sent a team to monitor the runoff of water used for firefighting into the Saddle River, where there were reports that fish had died.

**Jackson, Mississippi, April 1995.** More than 200 vials of the chemical phosgene and compounds used in tear gas were dug up during construction of a trench at the Mississippi State Fairgrounds. The vials reportedly came from World War I chemical warfare "test kits," buried in the 1930s in a pond that was later filled with dirt. EPA's On-Scene Coordinator provided on-site air monitoring and technical advice. U.S. Army teams inventoried the vials and packaged them for transfer to a military base for treatment and disposal.

**Sargent Bluff, Iowa, December 1994.** A rupture in a natural gas pipeline caused an explosion at a facility, about 15 miles south of Sioux City, Iowa, that manufactures urea and ammonium nitrate for fertilizer. The explosion reportedly killed 4 people and injured at least 30. The incident was initially reported by a nearby resident who said there was a strong ammonia smell in the area. Local firefighters and hazardous materials teams responded and evacuated the immediate area. Within an hour, the fire had been extinguished, but the release of contaminants into the air continued. EPA and state government officials were concerned about the additional release of materials, because the plant has large tanks of nitric acid, anhydrous ammonia, and ammonium nitrate that may have been impacted by the explosion. The facility is located along the banks of the Missouri River.